

PCTWORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : A61K 9/12, 31/135, 31/46	A1	(11) International Publication Number: WO 99/65464 (43) International Publication Date: 23 December 1999 (23.12.99)
(21) International Application Number: PCT/US99/12785 (22) International Filing Date: 8 June 1999 (08.06.99) (30) Priority Data: 198 27 178.6 18 June 1998 (18.06.98) DE 198 42 963.0 19 September 1998 (19.09.98) DE (71) Applicant: BOEHRINGER INGELHEIM PHARMACEUTICALS, INC. [US/US]; 900 Ridgebury Road, Ridgefield, CT 06877 (US). (72) Inventors: McNAMARA, Daniel, P.; 30 Newton Terrace, Waterbury, CT 06708 (US). DeSTEFANO, George, A.; 13 Greenknoll Drive, Brookfield, CT 06804 (US). (74) Agents: RAYMOND, Robert et al.; Boehringer Ingelheim Pharmaceuticals, Inc., 900 Ridgebury Road, P.O. Box 368, Ridgefield, CT 06877 (US).		(81) Designated States: AE, AU, BG, BR, BY, CA, CN, CZ, EE, HR, HU, ID, IL, IN, JP, KR, KZ, LT, LV, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TR, UA, UZ, VN, YU, ZA, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>
(54) Title: PHARMACEUTICAL FORMULATIONS FOR AEROSOLS WITH TWO OR MORE ACTIVE SUBSTANCES (57) Abstract The present invention relates to new pharmaceutical formulations for aerosols with at least two or more active substances for administration by inhalation or by nasal route. Specifically, the invention relates to pharmaceutical preparations for propellant-driven metered dose aerosols using a fluorohydrocarbon (HFC) as propellant, which contain a combination of active substance of two or more active substances, wherein at least one active substance is present in dissolved form together with at least one other active substance in the form of suspended particles.		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

Prosecution application

5 **Pharmaceutical Formulations for Aerosols with two or more**
 Active Substances

The present invention relates to new pharmaceutical
formulations for aerosols with at least two or more active
10 substances for use by inhalation or by the nasal route.

State of the art

In propellant-driven metered dose inhalers (MDI) the
15 active substances can be formulated as solutions or
 suspensions. The vast majority of aerosol formulations
 for MDI's are prepared as suspensions, especially if the
 preparation contains more than one active substance.
 Formulations in the form of solutions are used only to a
20 limited extent. In these cases, the formulations normally
 contain only one active substance.

As a rule, in a suspension, the chemical stability of the
active substances is noticeably higher than in a solution.
25 Additionally, in a suspension the active substance can be
 more highly concentrated than in a solution, with the
 result that suspension type formulation enable higher
 doses to be administered.

30 A major disadvantage of suspension-formulations is the
 fact that over time (e.g. during storage) the suspended
 particles clump together to form bigger, more or less
 stable agglomerates or form loose flakes, sediments or
 floating layers, or in the worst case, particle growth,
35 which significantly impairs the pharmaceutical quality of
 the product. The size of the particles formed or the

speed of particle growth are influenced by the solubility features of the liquid phase. Thus, ingress of humidity during storage or a desired increase in polarity, e.g. achieved by adding co-solvents, can have a devastating effect on the quality of the medical end product, particularly if the suspended particles have polar structure elements. The suspension can be physically stabilised by the addition of surfactants, by reducing the harmful effects of moisture and/or particle growth so that suspended particles can be held in suspension for longer.

Natural solution-type formulations are not affected by the problems of increasing particle size or de-mixing processes such as sedimentation or flocculation. However, in this case there is a serious risk of chemical degradation. A further disadvantage is the fact that the limited solubility of the ingredients can prevent administration in high doses. In the past, the chlorofluorohydrocarbons TG 11 (trichlorofluoromethane), TG 12 (dichlorodifluoromethane) and TG 114 (dichlorotetrafluoroethane) have proved particularly suitable as solvents. The solubility of the ingredients can be increased by the addition of co-solvents. In addition, it is usually necessary to take additional measures to chemically stabilise the dissolved components.

Up till now, CFCs such as the above-mentioned TG 11, for example, have often been used as propellants. However, since CFCs have been linked with the destruction of the ozone layer, their manufacture and use are being phased out. The intention is to replace them with special fluorohydrocarbons (HFC) which are less destructive to the ozone layer but have completely different solubility features. The toxicological profile and physico-chemical properties such as the steam pressure, for example, determine which HFCs are suitable for MDIs. The most

promising representatives at present are TG 134a (1,1,2,2-tetrafluoroethane) and TG 227 (1,1,1,2,3,3,3-heptafluoropropane).

5 For inhalative treatment it may be desirable to have aerosol formulations with two or more active substances. In such cases the active substances are formulated in the necessary concentrations as solutions or suspensions, frequently giving rise to problems regarding the chemical
10 stability of the individual substances or the degree of concentration which can be attained. Major problems are encountered if one of the active substances cannot be suspended or is unstable in a suspension-type formulation of this kind or if one of the active substances is
15 chemically unstable or will not dissolve in a solution-type formulation of this kind, particularly when HFC is used as the propellant.

It is therefore one object of the present invention to
20 develop a formulation for metering aerosols having two or more active substances which overcomes the above-mentioned disadvantages.

Description of the invention

25

Surprisingly, it has been found that a plurality of active substances can be formulated as a solution and a suspension combined in one formulation.

30 The invention relates to stable aerosol formulations with fluorohydrocarbons as propellants, particularly TG 134a and/or TG 227, consisting of two or more active substances, wherein at least one active substance is formulated as a solution and at least one active substance
35 is formulated as a suspension. The pharmaceutical preparation according to the invention is used for

inhalative treatment, particularly for treating diseases of the pharynx and respiratory tract, e.g. asthmatic diseases and COPD.

5 Detailed description of the invention

In one embodiment a medicinally useful combination of two or more active substances is used, containing beclometasone, budesonide, cromoglycinic acid, fenoterol, 10 flunisolide, fluticasone, ipratropium bromide, nedocromil, orciprenaline, oxitropium bromide, reproterol, salbutamol (albuterol), salmeterol, terbutalin, N-[[2,2-dimethyl-4-(2-oxo-2H-pyridin-1-yl)-6-trifluoromethyl-2H-1-benzopyran-3-yl]methyl]-N-hydroxy-acetamide, the esters, salts and/or 15 solvates thereof. Which of the above-mentioned active substances is formulated as a solution and which as a suspension in the preparation according to the invention depends on the particular combinations of active substance and can be determined relatively quickly by solution and 20 suspension trials.

In a preferred embodiment, one or more of the following active substances are suspended: budesonide, cromoglycinic acid, nedocromil, reproterol and/or salbutamol (albuterol) 25 or the esters, salts and/or solvates derived from these compounds and one or more of the following substances are dissolved: beclomethasone, fenoterol, ipratropium bromide, orciprenaline and/or oxitropium bromide, N-[[2,2-dimethyl-4-(2-oxo-2H-pyridin-1-yl)-6-trifluoromethyl-2H-1- 30 benzopyran-3-yl]methyl]-N-hydroxy-acetamide or the esters, salts and/or solvates derived from these compounds. Embodiments having two different active substances are preferred.

35 A particularly preferred embodiment contains dissolved ipratropium bromide, particularly combined with salbutamol

sulphate (albuterol sulphate) as the suspended active substance.

In all the embodiments, the active substances are used in a therapeutically effective quantity, i.e. in a quantity that can induce a successful treatment. The concentration of the active substances and the volume per stroke of spray are adjusted in such a way that the quantity of active substance which is medically necessary or recommended is released by a single spray or by a few sprays.

One embodiment relates to formulations in which the suspended particles are stabilised by the addition of surfactant substances (surfactants) or other suspension-stabilising agents to stabilise the suspended particles against physical changes. The benefit of this is that the particle size will remain pharmaceutically acceptable even over lengthy periods, e.g. during storage. Preferred particle sizes are up to 20 μm , whilst particularly preferred particle sizes are between 5 and 15 μm , best of all not exceeding 10 μm . The advantage of these particle sizes is that the particles are small enough to penetrate deeply into the lungs but not so small as to be breathed out again with the exchanged air.

Suitable surfactants and suspension-stabilising agents include all pharmacologically acceptable substances which have a lipophilic hydrocarbon group and one or more functional hydrophilic groups, especially C_{5-20} fatty alcohols, C_{5-20} fatty acids, C_{5-20} fatty acid esters, lecithin, glycerides, propyleneglycol esters, polyoxyethylenes, polysorbates, sorbitan esters and/or carbohydrates. C_{5-20} fatty acids, propyleneglycol diesters and/or triglycerides and/or sorbitans of the C_{5-20} fatty acids are preferred, whilst oleic acid and sorbitan mono-,

di- or trioleates are particularly preferred.

Alternatively, toxicologically and pharmaceutically acceptable polymers and block-polymers can be used as suspension-stabilising agents. The surfactants used are
5 either non-fluorinated or partially fluorinated or perfluorinated, the term fluorinated referring to the exchange of hydrogen radicals bound to the carbon for fluorine radicals. The quantity of surfactant may be up to 1:1 based on the proportion by weight of the suspended
10 active substances; amounts of 0.0001:1 to 0.5:1 are preferred, whilst amounts of from 0.0001:1 to 0.25:1 are particularly preferred.

A further advantage of the above surfactants is that they
15 can also be used as valve lubricants. Therefore, one embodiment relates to formulations in which said surfactants are added as valve lubricants.

In another embodiment the solubility of at least one
20 active substance to be dissolved is increased by the addition of one or more co-solvents. This has the advantage that the active substance or substances to be dissolved can be formulated in higher concentrations. The addition of co-solvent must not exceed the critical
25 threshold of polarity of the liquid phase at which one of the disadvantages described above begins to affect the suspended particles of active substance.

Suitable co-solvents are pharmacologically acceptable
30 alcohols such as ethanol, esters or water or mixtures thereof; ethanol is preferred. The concentration of the co-solvent in relation to the total formulation may be from 0.0001 to 50 wt.-%, preferably 0.0001 to 25 wt.-%. In another embodiment a concentration of 0.0001 to
35 10 wt.-% is preferred whilst particularly preferred embodiments are those wherein just enough alcohol is added

to dissolve the active substance which has to be dissolved.

In another embodiment, other common propellants are added to the HFC propellant. These added propellants may be, beside other HFCs, saturated lower hydrocarbons such as propane, butane, isobutane or pentane provided that the mixture is pharmacologically acceptable.

In one embodiment, stabilisers are added to the formulation, with a beneficial effect on the pharmaceutical stability of the active substances even over lengthy periods, e.g. during storage. In the context of the invention, stabilisers denotes those substances which prolong the durability and usability of the pharmaceutical preparation by preventing or delaying chemical changes in the individual ingredients, particularly the active substances, e.g. caused by subsequent reactions or degradation, or those which prevent biological contamination. Stabilisers which are preferred for this purpose are those which influence the pH of the liquid phase, such as acids and/or the salts thereof, particularly suitable substances are hydrochloric acid, sulphuric acid, nitric acid, phosphoric acid, ascorbic acid, citric acid and the salts thereof. In addition, preferred bactericides, fungicides etc. are benzalkonium chloride or ethylene diamine tetraacetate. Citric acid is most preferred. The concentration of the stabilisers may be up to 1000 ppm, preferably up to 100 ppm and most preferably 20 to 40 ppm.

One particularly preferred embodiment comprises suspended salbutamol sulphate (albuterol sulphate), dissolved ipratropium bromide, ethanol as co-solvent and citric acid as stabiliser.

ExamplesExample 1

5 In a solution of liquefied 89.96 g (1 mol, 89.71 wt.-%) of
TG 134a and 10.03 g (218 mmol, 10.00% by weight) of
ethanol are dissolved 37 mg (0.09 mmol, 0.037 wt.-%) of
ipratropium bromide and 4 mg (20 μ mol, 0.004% by weight)
of citric acid and 210.5 mg (0.88 mmol, 0.21% by weight)
10 of salbutamol sulphate (albuterol sulphate) are suspended
together with 0.05% by weight of surfactant (e.g. 50 mg
(177 mmol) of oleic acid).

Example 2

15

Analogous to Example 1 using TG 227 as the propellant gas
instead of TG 134a.

Example 3

20

Disodium chromoglycate is suspended in liquefied P134 and
a small amount of ethanol and fenoterol hydrobromide is
dissolved therein.

25 Example 4

Analogous to Example 3 using TG 227 as propellant gas
instead of TG 134a.

Patent Claims

1. Pharmaceutical preparation for propellant driven
metered dose inhalers having a fluorohydrocarbon
5 (HFC) as propellant, which contain a combination of
two or more active substances characterised in that
at least one active substance is present in dissolved
form by the use of a co-solvent together with at
least one other active substance in the form of
10 suspended particles.
2. Pharmaceutical preparation according to claim 1,
characterised in that the combination of active
substances consists of two active substances.
15
3. Pharmaceutical preparation according to one of the
preceding claims, characterised in that the
propellant is TG 134a and/or TG 227.
- 20 4. Pharmaceutical preparation according claim 3,
characterised in that the co-solvent comprises one or
more pharmacologically tolerable alcohols, a
pharmacologically tolerable ester, water or a mixture
thereof.
- 25 5. Pharmaceutcal preparation according to claim 3,
characterised in that the co-solvent is ethanol.
6. Pharmaceutical preparation according to claim 3, 4 or
30 5 characterised in that the co-solvent is present in
a concentration of up to 25% by weight, based on the
quantity of liquefied propellant.
7. Pharmaceutical preparation according to claim 3, 4, 5
35 or 6, characterised in that the co-solvent is present

in a concentration of up to 10% by weight, based on the quantity of liquefied propellant.

8. Pharmaceutical preparation according to claim 1, 2,3,
5 4, 5, 6 and 7, characterised in that the composition is stabilised by a stabiliser.
9. Pharmaceutical preparation according to claim 8,
10 characterised in that the stabiliser contains one or more acids and/or salts.
10. Pharmaceutical preparation according to claim 8 or 9,
characterised in that the stabiliser(s) contain(s)
15 hydrochloric acid, sulphuric acid, nitric acid, phosphoric acid, ascorbic acid, citric acid, benzalkonium chloride and/or ethylene diamine tetraacetic and/or a salt thereof.
- 20 11. Pharmaceutical preparation according to claim 8 to 10, characterised in that the stabiliser is citric acid.
12. Pharmaceutical preparation according to one of the
25 preceding claims 8 to 11, characterised in that the stabiliser is present in an amount of up to 100 ppm.
13. Pharmaceutical preparation according to one of the
preceding claims 8 to 11, characterised in that the
30 stabiliser is present in an amount of up to 40 ppm.
14. Pharmaceutical preparation according to one of the
preceding claims 1 to 13, characterised in that the
preparation contains a surfactant or suspension-
35 stabilising agent.

15. Pharmaceutical preparation according to claim 14,
characterised in that the surfactant contains C₅₋₂₀
fatty alcohols, C₅₋₂₀ fatty acids, C₅₋₂₀ fatty acid
esters, lecithin, glycerides, propyleneglycol esters,
5 polyoxyethanes, polysorbates, sorbitan esters and/or
carbohydrates.
16. Pharmaceutical preparation according to claim 14,
characterised in that the surfactant contains C₅₋₂₀
10 fatty acids and/or the esters thereof.
17. Pharmaceutical preparation according to claim 14,
characterised in that the surfactant contains oleic
acid and/or sorbitan mono-, di- or trioleate.
15
18. Pharmaceutical preparation according to claim 14,
characterised in that the surfactant contains oleic
acid.
- 20 19. Pharmaceutical composition according to claim 14
characterised in that the surfactant or suspension-
stabilising agent comprises a toxicologically
acceptable polymer and/or block-polymer.
- 25 20. Pharmaceutical preparation according to one of the
preceding claims, characterised in that the active
substance combination contains beclomethasone,
budesonide, cromoglycinic acid, fenoterol,
flunisolide, fluticasone, ipratropium, nedocromil,
30 orciprenaline, oxitropium bromide, reproterol,
salbutamol, salmeterol (albuterol), terbutalin, N-
[[2,2-dimethyl-4-(2-oxo-2H-pyridin-1-yl)-6-
trifluoromethyl-2H-1-benzopyran-3-yl]methyl]-N-
hydroxy-acetamide, the esters, salts and/or solvates
35 thereof.

21. Pharmaceutical preparation according to one of claims 1 to 20, characterised in that the active substance combination contains salbutamol sulphate (albuterol sulphate) and ipratropium bromide.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/12785

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61K9/12 A61K31/135 A61K31/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 01147 A (RHONE POULENC RORER LTD ;BELL ALEXANDER (GB)) 15 January 1998 (1998-01-15)	1-7, 14
Y	page 2, line 22-25 page 3, line 1-23 page 4, line 17 -page 5, line 8 examples 3,4 claims 1-4,6,12,20 ---	20,21
X	US 5 589 156 A (HENRY RICHARD A) 31 December 1996 (1996-12-31) abstract column 3, line 13-31 column 7, line 35-60 claims --- -/--	1,3

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

28 September 1999

Date of mailing of the international search report

04/10/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

La Gaetana, R

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/12785

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 603 918 A (MCNAMARA DANIEL) 18 February 1997 (1997-02-18) column 2, line 31-59 examples claims	20,21
A	WO 94 13262 A (JAGER PAUL D ;KONTNY MARK J (US); NAGEL JURGEN H (DE)) 23 June 1994 (1994-06-23) page 4, line 12-21 page 5, line 22,23 page 6, line 1-7 page 8, line 3-6 page 10, line 6-11 page 10, line 17-30 page 16 -page 18; tables 2-4 claims 1-3,6,8-10,12,32	1,3-6, 8-18,20, 21
A	EP 0 499 344 A (RIKER LABORATORIES INC) 19 August 1992 (1992-08-19) page 2, line 39-50 page 4, line 36 -page 5, line 5 page 6, line 1-10 examples 4-6,24 claims 1,2,6,10,12	1,3-6, 14-21

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/12785

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9801147 A	15-01-1998	AU 3453897 A EP 0914143 A	02-02-1998 12-05-1999
US 5589156 A	31-12-1996	US 5534242 A US 5453445 A US 5593661 A AU 4711396 A CA 2215680 A WO 9629066 A EP 0814793 A JP 11502202 T US 5858331 A AU 4711496 A CA 2215711 A WO 9630008 A EP 0814794 A JP 11502526 T US 5679325 A	09-07-1996 26-09-1995 14-01-1997 08-10-1996 26-09-1996 26-09-1996 07-01-1998 23-02-1999 12-01-1999 16-10-1996 03-10-1996 03-10-1996 07-01-1998 02-03-1996 21-10-1997
US 5603918 A	18-02-1997	NONE	
WO 9413262 A	23-06-1994	AT 177941 T AU 680227 B AU 5740594 A AU 6048694 A BG 99760 A CZ 9501490 A DE 69324161 D EP 0673240 A ES 2129117 T FI 952842 A GB 2288978 A,B HU 72985 A JP 8509459 T LV 10911 A LV 10911 B NO 952269 A NZ 259192 A PL 309333 A SG 52459 A SK 76095 A WO 9413263 A US 5676930 A CN 1095265 A ZA 9309195 A	15-04-1999 24-07-1997 04-07-1994 04-07-1994 29-02-1996 13-12-1995 29-04-1999 27-09-1995 01-06-1999 09-06-1995 08-11-1995 28-06-1996 08-10-1996 20-12-1995 20-04-1996 08-06-1995 26-05-1997 02-10-1995 28-09-1998 08-01-1997 23-06-1994 14-10-1997 23-11-1994 08-06-1995
EP 0499344 A	19-08-1992	AU 631155 B AU 4595689 A CA 2004598 A DE 68924540 D DE 68924540 T DK 595789 A EP 0372777 A EP 0653204 A ES 2045470 T ES 2077971 T HK 7196 A HK 80497 A	19-11-1992 14-06-1990 06-06-1990 16-11-1995 15-05-1996 07-06-1990 13-06-1990 17-05-1995 16-01-1994 01-12-1995 26-01-1996 20-06-1997

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/12785

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0499344 A		IL 92457 A	21-10-1994
		JP 2200627 A	08-08-1990
		JP 2786493 B	13-08-1998
		MX 9203480 A, B	01-07-1992
		US 5695743 A	09-12-1997
		US 5683677 A	04-11-1997
		US 5674473 A	07-10-1997
		US 5225183 A	06-07-1993
		US 5766573 A	16-06-1998
		US 5776434 A	07-07-1998
		US 5720940 A	24-02-1998